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DISCUSSION OF INFLUENCE OF HEAVY LOADS ON PAVEMENT DESIGN TRENDS

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DISCUSSION

WILLIAM S. POLLARD, JR.[3] JUN. ASCE.—An excellent survey of highway load and design trends since about 1920 has been presented in this paper.

In support of the traffic load trends stated in the paper (under the heading, "Trend in Traffic Loads") and concentrating on axle loads greater than 18,000 lb, Table 3 is submitted as portraying the high axle-load trend in Illinois through 1948. The marked and progressive increase in violations is evident, looming exceptionally large when the increase from 1942 to 1948 is reported as a percentage of the 1942 values.

TABLE 3.—AXLE WEIGHTS IN EXCESS OF LEGAL LIMIT OF 18,000 LB IN ILLINOIS[a]

Axle-Load Group, in Pounds		Percentage of Total Axle Loads Weighed								
		Single-truck units			Tractor truck semitrailers			Trailer combination[b]		
From	To	1948	1942	1936	1948	1942	1936	1948	1942	1936
18,000	18,999	0.25	0.34	0.00	3.41	1.41	0.13	10.31	3.51	0.00
19,000	19,999	0.10	0.00	0.00	1.88	0.40	0.07	5.93	1.75	0.00
20,000	21,999	0.04	0.00	0.00	1.39	0.28	0.00	3.87	0.00	0.00
22,000	23,999	0.08	0.00	0.00	0.30	0.00	0.00	0.00	1.75	0.00
24,000	25,999	0.00	0.00	0.00	0.10	0.00	0.00	0.00	1.75	0.00
26,000	27,999	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00
>28,000		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total, overloaded axles		0.47	0.34	0.00	7.12	2.09	0.20	20.11	8.76	0.00
Percentage increase in violations, 1942 to 1948		38	....	....	240	....	....	129	....	....

[a] Adapted from tabulated data, from short surveys distributed over the state, presented in the "Thirty-first Annual Report of Division of Highways," Dept. of Public Works and Bldgs., Springfield, Ill., 1948, p. 179. [b] Tractor truck semitrailers with trailers and trucks with trailers.

Relative to corrective measures for the nation-wide highway distress caused by this trend toward overloads, the writer is in agreement with Mr. Woods' suggested procedures. However, since it is generally conceded that high overloads in even small numbers can inflict damage costing millions of dollars to repair, it is the opinion of the writer that the "strict enforcement of existing weight laws" suggested in the paper (item 3(*a*) under the heading, "Summary") should include the establishment by states of on-the-spot unloading and of mandatory, uniform, practically prohibitive fines for violators. Furthermore, fines so assessed should be restricted to highway use. Such a policy, rigidly enforced, would certainly decrease the number of overloads on a highway sys-

NOTE.—This paper by K. B. Woods was published in June, 1950. The numbering of footnotes, tables, and bibliography in this Separate is a continuation of the consecutive numbering used in the original paper.

[3] Instr. of Civ. Eng., Univ. of Illinois, Urbana, Ill.

tem in a short time, and would contribute in part to the repair of damage already effected by the violator group—a group representing only from 5% to 10% of the total trucks on the road. When he knows the penalty for homicide in advance, and is aware that in most cases apprehension is inevitable, the average individual takes pause before taking a life, regardless of provocation. The parallel is evident.

An expedient to the enactment of suitable legislation to cover the handling of violators would be to inform the public, more completely, of the existing situation—its cause, and the steps necessary to correct this situation. The press and popular magazines are the logical avenues of approach for such an action. The average highway user, made aware of this unjustifiable drain on "his" tax money, is capable of contributing toward considerable group pressure —pressure of a desirable nature in this instance.

A direct reference to the fatigue properties of concrete would have been desirable in this paper. Extensive tests (4)[3a] have established the fact that the use of a minimum design safety factor of 2, on the basis of the predominating wheel load, provides protection against failure in fatigue, regardless of the number of load applications. Those interested in bringing about an increase in allowable axle loads might attempt to justify this increase on the basis of this safety factor, choosing to emphasize the safety factor itself and to minimize its reason for existing. Any effort in this direction should be vigorously opposed, not with the view of opposing progress as such, but with a determination that any pseudo progress that would in actuality constitute a step backward will not be permitted. If it is deemed an over-all economic necessity that greater axle loads be permitted, then highways must be built to accomodate them and their travel must be restricted to highways so designed. These "musts" are fundamental requirements for maintaining the level at which the national highway system now exists.

K. B. Woods,[4] M. ASCE.—Lively interest continues in the subject of the destructive effects of heavy loads on highway pavements and the trends in pavement designs. During 1950, the Highway Research Board, in cooperation with several state highway departments, the Bureau of Public Roads, the Automobile Manufacturers Association, and the American Trucking Association, initiated large-scale controlled field tests on a section of road in Maryland. The purpose of the test road was to study the performance of a concrete pavement under the operation of commercial-type vehicles loaded to 18,000 lb and 22,400 lb on single axles and 32,000 lb and 44,800 lb on tandem axles.

In his discussion, Mr. Pollard submits some traffic-load trend data for Illinois covering the years 1936, 1942, and 1948. In February, 1950, John T. Lynch and Thomas B. Dimmick reported some nation-wide data on axle-load and gross-load trends. The report stated that

[3a] Numerals in parentheses, thus: (4), refer to corresponding items in the Bibliography (see Appendix of the paper), and at the end of discussion) in this issue.

[4] Associate Director, Joint Highway Research Project, and Prof. of Highway Eng., Purdue Univ., West Lafayette, Ind.

> "* * * the total number of heavy axle loads found on the highways in 1948 was eighteen times the number in the 1936–37 period, and the rate of increase appears to be accelerating rapidly (97)."

In December, 1950, in an article on traffic trends on rural roads in 1949, Mr Dimmick reported that

> "In 1949 more than 5 percent of all trucks and combinations exceeded a state legal weight limit and 16 percent of the combinations were illegally overloaded in some particular (98)."

Comparing the pre-World War II period with the information available in 1949, he reported a 750% increase in the frequency of occurrence of axle loads in excess of 22,000 lb. Rather strict enforcement of truck-weight laws in the various states may account for the slight decrease in the number of over-loaded trucks per thousand in 1949 as compared with 1947 or 1948. Mr. Dimmick reported 75 instances of overloading per thousand cases in 1949, a rate of 66 per thousand cases in 1947, and 85 over-loaded vehicles per thousand cases in 1948.

Mr. Pollard's reference to fatigue properties of concrete is a worthy addition to the subject of rigid pavement design trends. The subject of fatigue action in rigid pavement slabs has been neglected a long time.

Bibliography.—

(4) **"Highway Research in Illinois,"** by Clifford Older, *Transactions*, ASCE, Vol. LXXXVII, 1924, p. 1180.

(97) **"Axle-Load and Gross-Load Trends,"** by John T. Lynch and Thomas B. Dimmick, *Public Roads*, Vol. 25, No. 12, February, 1950, p. 279.

(98) **"Traffic Trends on Rural Roads in 1949,"** by Thomas B. Dimmick, *Public Roads*, Vol. 26, No. 5, December, 1950, p. 85.

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